EVALUATION OF WATER QUALITY CHARACTERISTICS AT PERTH AMBOY WATER SUPPLY WELL NO. 6 (PA-6)

Prepared For

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INTRODUCTION

Pursuant to a Court Order issued in 1992, a stripping tower was constructed at the City of Perth Amboy's water supply well No. 6 (PA-6) for the treatment of volatile organics. The tower, which became operational in March 1994, is designed to treat raw water from PA-6 prior to its conveyance to the existing Runyon water plant. Marginal levels of volatile organics had been detected in PA-6 in the late 1980s. While other volatile organics have occasionally been detected, benzene and chlorobenzene were the principal contaminants of concern.

A review of the water quality data has been conducted for the purpose of assessing the need, or not, to use a stripping tower. The data clearly indicate that neither the construction or use of a stripping tower was necessary. In fact, the data confirm predictions made on behalf of CPS Chemical several years ago; that is, that any volatile organic contamination had reached a basically steady state condition in the groundwater system such that concentrations of volatile organics at PA-6 would not worsen. They in fact would decline. The following provides the analysis which led to these findings.

WATER QUALITY ANALYSIS

The City of Perth Amboy has historically monitored water quality directly at the well head of PA-6. Water quality data represent the quality of the raw water from a sampling tap at the well head. Concurrently, monitoring has been conducted on the finished water which is collected from a sampling tap at the discharge from the Runyon Plant prior to conveyance to the public.

The analytical water quality data encompass a 4½-year period from August 1990 – February 1995. Table 1 presents the results of the analysis of benzene and chlorobenzene in the raw water from PA-6. Table 2 summarizes the analysis of the finished water following conveyance through the Runyon water plant. Graphical representation of the data have also been provided in Figures 1 – 4. These results have been obtained from analyses performed by contract laboratories retained by the City of Perth Amboy.

Based upon our review of the data in Table 1 and in Figures 1 and 2, chlorobenzene concentrations at the well head remained relatively stable from April 1991 to February 1992; that is there was no indication of an increasing trend in chlorobenzene concentrations. During this period concentrations fluctuated from roughly 7 – 14 parts per billion (ppb). Thereafter there was a gradual decrease in chlorobenzene concentrations in the raw water. From March 1992 to October 1992 chlorobenzene concentrations decreased from about 8 ppb to less than 4 ppb which is the Maximum Contaminant Level (MCL) for this constituent.* Since October 1992 there have been no detections of chlorobenzene at concentrations above the MCL at PA-6. Subsequently, chlorobenzene concentrations have steadily declined to levels of less than 1 ppb, and since December 1994 there have been no detections of chlorobenzene in the well.

Benzene concentrations in the raw water at PA-6 fluctuated from roughly 1 – 2.5 ppb during August 1990 to November 1992. Thereafter concentrations ranged from non-detect to 0.8 ppb, which is below the 1 ppb MCL for this constituent. The only exception was one reading on March 12, 1993, which was at the MCL of 1 ppb. Since December 1992, there have been no detections of benzene in excess of the MCL, and benzene has not been detected in PA-6 since April 1993.

The above analysis is consistent with past representations made on behalf of CPS Chemical regarding the water quality characteristics at the supply well. On September 30, 1991, a technical meeting was held with NJDEP and representatives of CPS, Madison Industries and the City of Perth Amboy to discuss whether there was, in fact, a threat to the Perth Amboy supply wells. During that meeting, representatives for CPS indicated that contaminant concentrations in PA-6 would not increase but would reduce with time. In December 1991, Wehran EnviroTech prepared a report including an interpretation of the water quality characteristics in PA-6 with particular reference to the benzene and chlorobenzene concentrations at the supply well. This report included a review of data from August 1990 to November 1991 and represented an assessment of water quality conditions

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* The federal standard is 100 ppb. At the time of the 1992 court case, the State's more restrictive standard was being reconsidered. The New Jersey Drinking Water Quality Institute recommended an increase to 50 ppb. This recommendation has since been accepted by the DEP and a formal proposal to change the applicable regulations is expected soon. CPS tried to introduce the recommendation for a new standard of 50 ppb at the hearings but was not allowed to do so.

within the aquifer following the commencement of remedial pumping operations which began in January 1991. The report concluded that:

> "...water quality conditions within the aquifer, with respect to benzene and chlorobenzene, appear to reflect a stabilized condition...Continued operation of pumping well RW-2 will remediate the higher levels of contamination which reside within the pumping wells' capture zone. Under these circumstances, concentrations of benzene and chlorobenzene would be expected to decrease with time..."

During the plenary hearing in 1992 representatives for CPS presented testimony that levels of volatile organic contamination in the supply well would continue to decline with time, making a volatile organic treatment system for the supply well unnecessary.

In addition to the analysis of raw water at the PA-6 well head, chlorobenzene and benzene concentrations in the finished water have been evaluated. These data are summarized in Table 2 and graphically represented in Figures 3 and 4. The data are summarized from August 1990 to March 1994. This corresponds to the time period prior to the operation of the air stripping tower. As such, water quality is representative of existing treatment in the Runyon plant. The data clearly show that at no time have there been any exceedances of MCLs in the finished water at the Runyon plant. From August 1990 – October 1992, chlorobenzene concentrations in the finished water have been a fraction of the concentrations detected in the raw water, usually ten to twenty percent. Since that time there have been no detections of chlorobenzene in the finished water.

The concentrations of benzene in the finished water have consistently been below 0.5 ppb throughout the period. This is well below the 1 ppb MCL for benzene. A review of Figure 4 clearly indicates that any detections of benzene in the finished water have been an insignificant fraction of the 1 ppb MCL.

There are two factors which have served to effectively reduce the concentration of benzene and chlorobenzene in the finished water. First, water from PA-6 represents only a portion of the total water supply for the City of Perth Amboy, and other water supply wells provide water to the Runyon plant which dilutes the water from PA-6. Second, the concentrations of benzene and chlorobenzene are further reduced as a result of aeration of groundwater at the plant.

During the plenary hearing in 1992 representatives for CPS maintained that the existing Runyon plant was capable of providing adequate treatment of existing and

anticipated levels of volatile organic contamination originating from PA-6. The existing data clearly confirms the testimony presented during the 1992 hearing.

In addition, CPS chemical has been operating a groundwater recovery system since January of 1991, which is remediating the volatile organic contamination in the aquifer. This system consists of groundwater pumping wells which control and capture the volatile organic contamination in the aquifer and prevents the migration of significant contamination to the Perth Amboy water supply wells. The water quality data indicate that this remediation system has and continues to work effectively.

CONCLUSION

In summary, based upon the above analysis of water quality characteristics, construction of a stripping tower was not necessary to remediate any threat of contamination to the Perth Amboy water supply. Moreover, its operation for such a purpose has never been, and is not presently, justified.

Table 1
PA–6 CHLOROBENZENE AND BENZENE CONCENTRATIONS (ppb)
AUGUST 1990 – FEBRUARY 1995

SAMPLING DATE	WELL #6 Chlorobenzene	WELL #6 Benzene
22 Aug 90	3	1.3
21 Sep 90		
5 Oct 90		ND
12 Oct 90	4.38	ND
5 Nov 90		
16 Nov 90		
19 Nov 90		
26 Nov 90		
5 Dec 90		
10 Dec 90		
14 Jan 91	8.2	1.8
5 Feb 91	4	2
19 Feb 91	<0.5	<0.5
26 Feb 91	2	<0.5
5 Mar 91	5.6	1
12 Mar 91	<0.5	<0.5
19 Mar 91	9.3	1.8
26 Mar 91	4.6	1.3
2 Apr 91	11.8	2.2
9 Apr 91	10.8	2.1
12 Apr 91	13	2.1
16 Apr 91	9.2	3.1
23 Apr 91	11	3.9
30 Apr 91	20.3	3.3
7 May 91	16	2.8
14 May 91	6.4	2
21 May 91	6.1	1.2
28 May 91	10.5	1.8
4 Jun 91	7.5	1.9
11 Jun 91	9.9	2.1
18 Jun 91	12.1	2.9
25 Jun 91		
2 Jul 91	2	<0.5
9 Jul 91		
16 Jul 91	17.5	4.3
23 Jul 91	12	1.8
30 Jul 91	14.4	2.6
8 Aug 91	12.9	2
13 Aug 91	<0.5	<0.5
20 Aug 91	13.4	2.3
27 Aug 91	13.1	2.7
29 Aug 91	5.6	1.9
3 Sep 91	6.6	2.4
4 Sep 91	5.3	2
10 Sep 91	6	2
17 Sep 91	6.3	1.7
24 Sep 91	8.4	2.1
1 Oct 91	7.4	<0.5
8 Oct 91	6.1	2.4
15 Oct 91	7.9	<0.5
22 Oct 91	8.6	2.3
28 Oct 91	14	2.6
29 Oct 91	10.6	2.3
5 Nov 91	12.4	0.2
19 Nov 91	9.2	2.2

Note: Absence of data indicate no analysis reported.

Table 1
PA–6 CHLOROBENZENE AND BENZENE CONCENTRATIONS (ppb)
AUGUST 1990 – FEBRUARY 1995

SAMPLING DATE	WELL #6 Chlorobenzene	WELL #6 Benzene
26 Nov 91	10.1	2
3 Dec 91	13.4	1.8
10 Dec 91	6.5	0.4
17 Dec 91	5.8	1.3
26 Dec 91	7.5	<0.5
7 Jan 92	7.7	1.8
13 Jan 92	11.9	2
21 Jan 92	10	2.1
3 Feb 92	11.4	<0.5
5 Feb 92	12.1	4.8
13 Feb 92	12.2	2.5
24 Feb 92	10.8	1.9
2 Mar 92	8.1	1.6
9 Mar 92	6.6	1.4
16 Mar 92	7	1.4
20 Mar 92	6.4	1.4
23 Mar 92	6	1.6
2 Apr 92	5.1	1
7 Apr 92	6	1.1
14 Apr 92	4.5	0.8
20 Apr 92	4	1.1
27 Apr 92	4.7	1
4 May 92	4.2	1.1
12 May 92	4	ND
21 May 92	7.5	1.9
26 May 92	4.8	ND
1 Jun 92	5.3	ND
9 Jun 92	4.5	ND
15 Jun 92	3.1	ND
22 Jun 92	3.6	1
6 Jul 92	3.8	0.8
13 Jul 92	3.5	1.1
20 Jul 92	4.8	0.8
27 Jul 92	2.8	0.8
31 Jul 92	4.2	1.6
8 Aug 92	4.4	1.1
14 Aug 92	4.6	1.3
21 Aug 92	2.1	0.5
4 Sep 92	3.3	1.3
11 Sep 92	4.4	1.3
18 Sep 92	4.4	1.4
25 Sep 92	4.9	1.5
2 Oct 92	4	1.3
9 Oct 92	4.1	1.2
16 Oct 92	3.6	1.1
23 Oct 92	3.8	1.1
30 Oct 92	3.4	0.8
9 Nov 92	2.3	1
13 Nov 92	2.8	0.9
20 Nov 92	3.3	1.1
4 Dec 92	2.6	0.7
18 Dec 92	ND	ND
8 Jan 93	1.8	0.6
15 Jan 93	2	0.6
22 Jan 93	1.6	ND

Table 1
PA–6 CHLOROBENZENE AND BENZENE CONCENTRATIONS (ppb)
AUGUST 1990 – FEBRUARY 1995

SAMPLING DATE	WELL #6 Chlorobenzene	WELL #6 Benzene
29 Jan 93	2	0.6
5 Feb 93	1.8	0.7
11 Feb 93	2	0.6
19 Feb 93	1.8	0.8
26 Feb 93	1.7	ND
5 Mar 93	1	ND
12 Mar 93	1.7	1
26 Mar 93	1.8	0.6
8 Apr 93	1.9	0.6
16 Apr 93	1.4	ND
23 Apr 93	1.2	ND
30 Apr 93	1.2	ND
10 Feb 94	ND	ND
23 Feb 94	1.1	ND
28 Feb 94	0.9	ND
4 Mar 94	ND	ND
9 Mar 94	ND	ND
11 Mar 94	ND	ND
22 Mar 94	0.8	ND
30 Mar 94	ND	ND
7 Apr 94	0.8	ND
13 Apr 94	0.9	ND
14 Apr 94	0.9	ND
20 Apr 94	0.7	ND
27 Apr 94	0.7	ND
4 May 94	0.8	ND
11 May 94	0.8	ND
18 May 94	0.8	ND
25 May 94	0.8	ND
6 Jun 94	0.7	ND
8 Jun 94	0.6	ND
15 Jun 94	0.6	ND
22 Jun 94	ND	ND
29 Jun 94	0.6	ND
6 Jul 94	0.6	ND
13 Jul 94	0.6	ND
19 Jul 94	0.6	ND
27 Jul 94	0.6	ND
3 Aug 94	0.6	ND
10 Aug 94	0.5	ND
16 Aug 94	0.6	ND
24 Aug 94	ND	ND
31 Aug 94	ND	ND
7 Sep 94	ND	ND
14 Sep 94	0.5	ND
21 Sep 94	0.5	ND
28 Sep 94	0.5	ND
5 Oct 94	0.5	ND
12 Oct 94	ND	ND
19 Oct 94	0.6	ND
26 Oct 94	ND	ND
2 Nov 94	0.5	ND
9 Nov 94	0.6	ND
16 Nov 94	0.5	ND
22 Nov 94	0.5	ND

Table 1

PA–6 CHLOROBENZENE AND BENZENE CONCENTRATIONS (ppb)

AUGUST 1990 – FEBRUARY 1995

SAMPLING DATE	WELL #6 Chlorobenzene	WELL #6 Benzene
30 Nov 94	0.6	ND
7 Dec 94	ND	ND
14 Dec 94	ND	ND
21 Dec 94	ND	ND
28 Dec 94	ND	ND
4 Jan 95	ND	ND
11 Jan 95	ND	ND
18 Jan 95	ND	ND
25 Jan 95	ND	ND
1 Feb 95	ND	ND
8 Feb 95	ND	ND
9 Feb 95	ND	ND
15 Feb 95	ND	ND
22 Feb 95	ND	ND

Table 2

FINISHED WATER CHLOROBENZENE AND BENZENE CONCENTRATIONS (ppb)
AUGUST 1990 – MARCH 1994

SAMPLING DATE	FINISHED WATER Chlorobenzene	Benzene
22 Aug 90		
21 Sep 90	ND	ND
5 Oct 90	ND	ND
12 Oct 90		ND
5 Nov 90	0.63	BDL
16 Nov 90	ND	ND
19 Nov 90	1.3	ND
26 Nov 90	0.91	BDL
5 Dec 90	1.1	BDL
10 Dec 90	1.16	BDL
14 Jan 91		
5 Feb 91	1	0.6
19 Feb 91	<0.5	<0.5
26 Feb 91	<0.5	<0.5
5 Mar 91	0.8	ND
12 Mar 91	<0.5	<0.5
19 Mar 91	1.6	<0.5
26 Mar 91	0.7	<0.5
2 Apr 91	1.6	<0.5
9 Apr 91	1.8	<0.5
12 Apr 91		
16 Apr 91	1.2	<0.5
23 Apr 91	1.7	<0.5
30 Apr 91	1.7	<0.5
7 May 91	1.4	<0.5
14 May 91	0.9	<0.5
21 May 91	1.1	<0.5
28 May 91	1.3	<0.5
4 Jun 91	1.3	<0.5
11 Jun 91	1.5	<0.5
18 Jun 91	1.5	<0.5
25 Jun 91	<0.5	<0.5
2 Jul 91	<0.5	<0.5
9 Jul 91	<0.5	0.5
16 Jul 91	1.6	<0.5
23 Jul 91	1.4	<0.5
30 Jul 91	2.2	<0.5
8 Aug 91	1.5	<0.5
13 Aug 91	1.7	<0.5
20 Aug 91	2.1	<0.5
27 Aug 91		
29 Aug 91	1.2	<0.5
3 Sep 91	0.9	<0.5
4 Sep 91	0.7	<0.5
10 Sep 91	1	0.4
17 Sep 91	1.3	<0.5
24 Sep 91	1.5	<0.5
1 Oct 91	1.3	<0.5
8 Oct 91	1.1	<0.5
15 Oct 91	1	<0.5
22 Oct 91	1.8	<0.5
28 Oct 91		
29 Oct 91	1.6	<0.5
5 Nov 91	1.7	0.5
19 Nov 91	1.9	0.5

Note: Absence of data indicate no analysis reported.

Table 2
FINISHED WATER CHLOROBENZENE AND BENZENE CONCENTRATIONS (ppb)
AUGUST 1990 – MARCH 1994

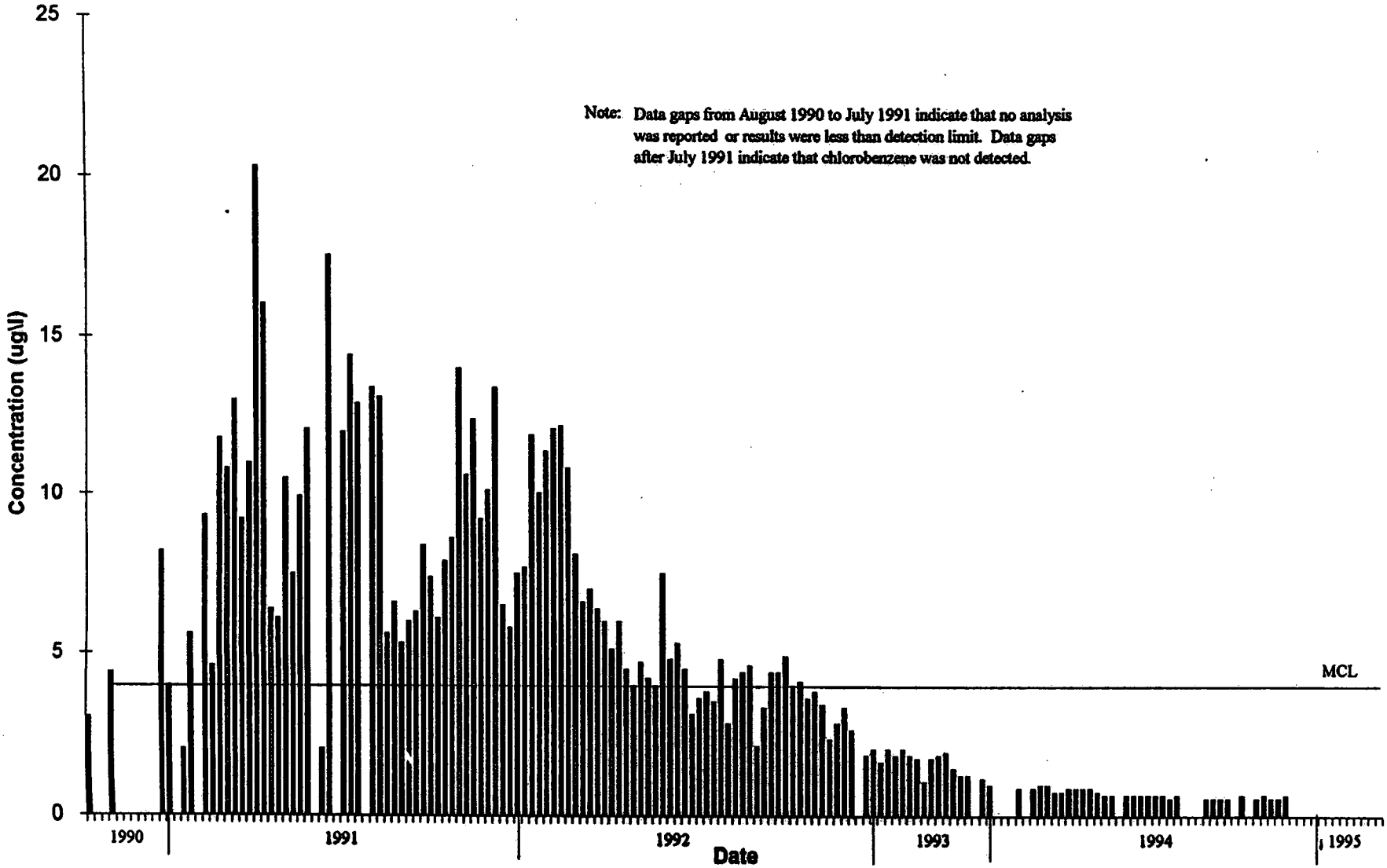
SAMPLING DATE	FINISHED WATER Chlorobenzene	Benzene
26 Nov 91	2.3	0.4
3 Dec 91	2	<0.5
10 Dec 91	1.2	<0.5
17 Dec 91	0.5	0.5
26 Dec 91	1	<0.5
7 Jan 92	1.5	0
13 Jan 92	2	0.3
21 Jan 92	1.7	0.3
3 Feb 92	2.1	<0.5
5 Feb 92	1.8	0.4
13 Feb 92	1.8	0.4
24 Feb 92	1.7	0.3
2 Mar 92	1.7	0.2
9 Mar 92	1.3	0.2
16 Mar 92	1.4	0.2
20 Mar 92	ND	ND
23 Mar 92	1.3	ND
2 Apr 92	0.9	* 4
7 Apr 92	1	ND
14 Apr 92	0.8	ND
20 Apr 92	0.6	ND
27 Apr 92	ND	ND
4 May 92	0.6	ND
12 May 92	0.7	ND
21 May 92	0.85	BDL
26 May 92	ND	ND
1 Jun 92	0.6	ND
9 Jun 92	ND	ND
15 Jun 92	0.5	ND
22 Jun 92	0.4	ND
6 Jul 92	0.6	ND
13 Jul 92	0.5	ND
20 Jul 92	0.8	ND
27 Jul 92	0.4	ND
31 Jul 92	ND	ND
8 Aug 92	0.5	ND
14 Aug 92	ND	ND
21 Aug 92	ND	ND
4 Sep 92	ND	ND
11 Sep 92	0.5	ND
18 Sep 92	0.5	ND
25 Sep 92	0.6	ND
2 Oct 92	ND	ND
9 Oct 92	0.6	ND
16 Oct 92	ND	ND
23 Oct 92	ND	ND
30 Oct 92	0.6	ND
9 Nov 92	ND	ND
13 Nov 92	ND	ND
20 Nov 92	ND	ND
4 Dec 92	ND	ND
18 Dec 92	ND	ND
8 Jan 93	ND	ND
15 Jan 93	ND	ND
22 Jan 93	ND	ND

* A 4 ppb detection of benzene cannot be attributable to PA–6 since the concentration in the raw water sample from PA–6 is only 1.0 ppb.

Table 2
FINISHED WATER CHLOROBENZENE AND BENZENE CONCENTRATIONS (ppb)
AUGUST 1990 – MARCH 1994

SAMPLING DATE	FINISHED WATER Chlorobenzene	Benzene
29 Jan 93	ND	ND
5 Feb 93	ND	ND
11 Feb 93	ND	ND
19 Feb 93	ND	ND
26 Feb 93	ND	ND
5 Mar 93	ND	ND
12 Mar 93	ND	ND
26 Mar 93	ND	ND
8 Apr 93	ND	ND
16 Apr 93	ND	ND
23 Apr 93	ND	ND
30 Apr 93	ND	ND
10 Feb 94	ND	ND
23 Feb 94	ND	ND
28 Feb 94	ND	ND
4 Mar 94	ND	ND
9 Mar 94	ND	ND
11 Mar 94	ND	ND
22 Mar 94	ND	ND
30 Mar 94	ND	ND

CHLOROBENZENE CONCENTRATIONS IN WELL PA-6 August 1990 - February 1995



BENZENE CONCENTRATIONS IN WELL PA-6 August 1990 - February 1995

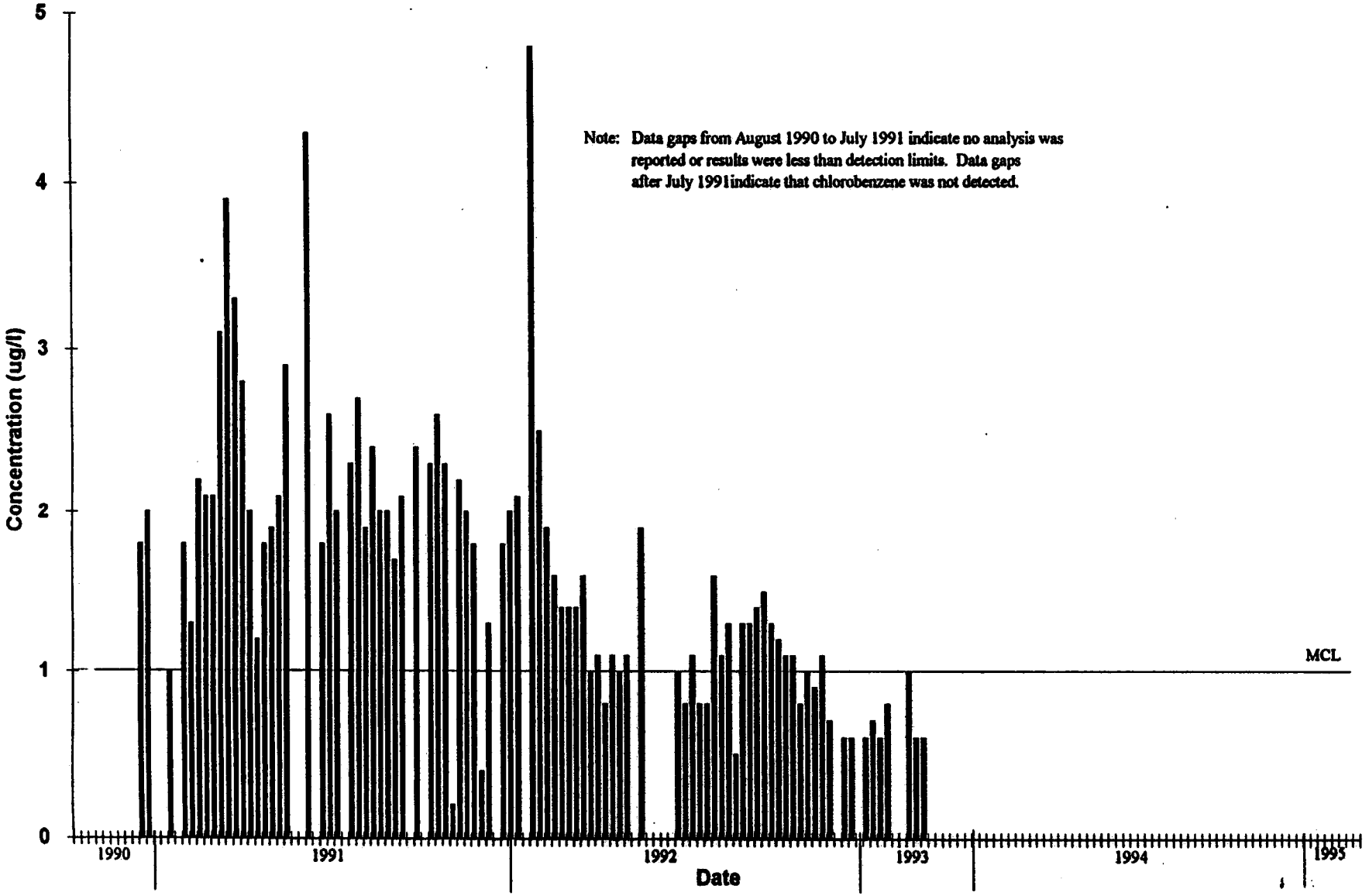
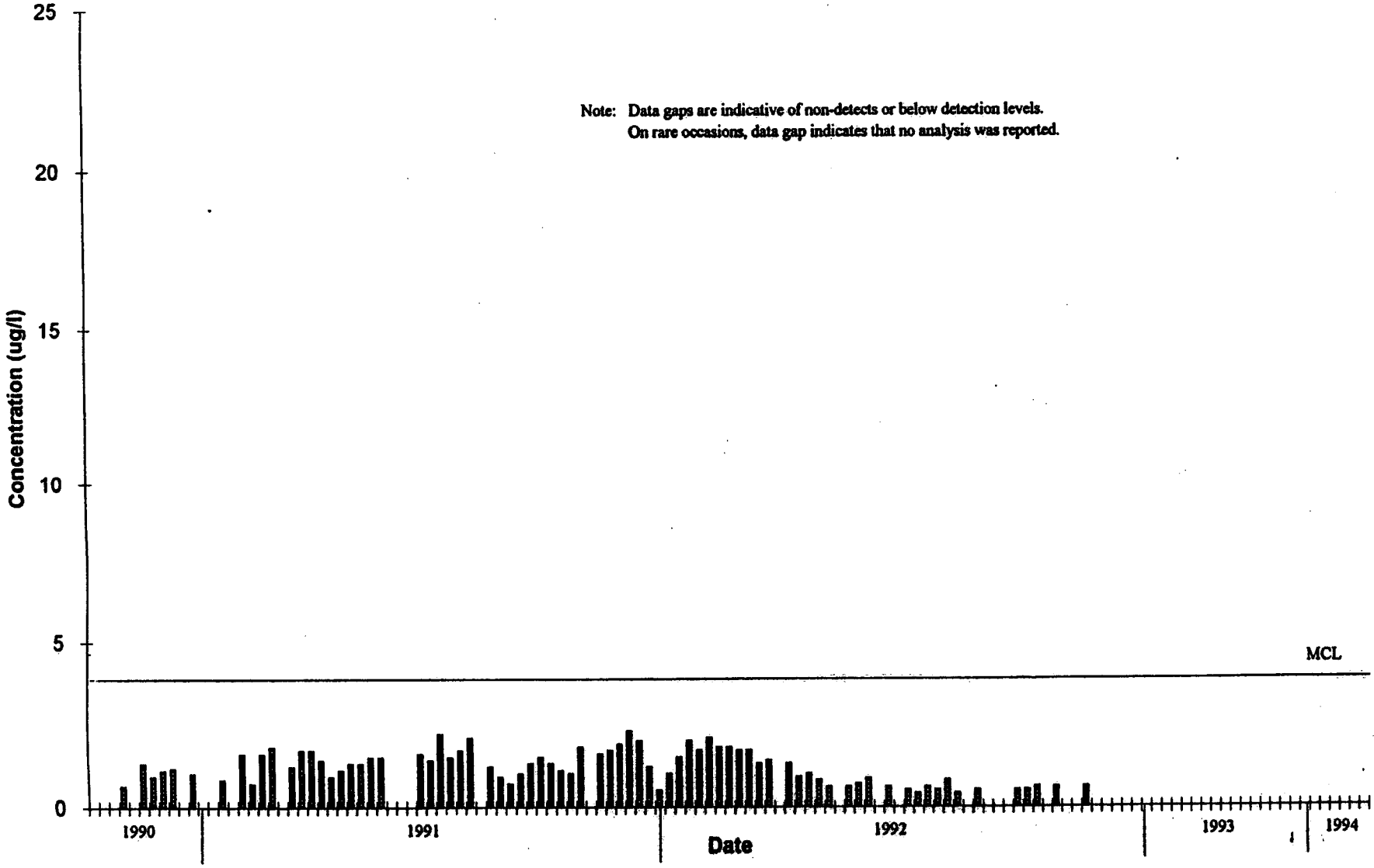


Figure 3

CHLOROBENZENE CONCENTRATIONS IN FINISHED WATER August 1990 - March 1994



BENZENE CONCENTRATIONS IN FINISHED WATER August 1990 - March 1994